IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

**PATENT APPLICATION**

Applicants: **Evans**

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Group Art Unit: **1764**

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Title: **MOBILE FLUID CATALYTIC CRACKING INJECTION SYSTEM**

Commissioner for Patents
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S I R:

# DECLARATION OF MARTIN EVANS UNDER 37 C.F.R. §1.132

**DECLARATION UNDER 37 C.F.R. §1.132**

I, Martin Evans, hereby declare as follows:

1. I, Martin Evans, am a Chartered Chemical Engineer in the UK, and a Fellow of the UK Institution of Chemical Engineers. I obtained my BSc in Chemical Engineering from the University of Wales in 1978. After working for seven years in the silicone industry, I worked two years at Exxon Research and Engineering in New Jersey followed by five years working on the FCC Unit at the Esso Fawley refinery in the UK. I left Esso to join Intercat in 1993.

I Martin Evans, am an inventor of this pending application. I joined Intercat in 1993, and am currently Director of Technical Service for all of Intercat's operations worldwide. I am responsible for a group of highly experienced Chemical Engineers dedicated to providing expert technical assistance to Intercat's customers on the use of FCC catalyst injection system. I am also responsible for design and development of Intercat's catalyst injection system technology.

2. I declare that I have read the September 24, 2007 Office Action, pending claims and the cited references below.

3. Nonobviousness over Andon U.S. Patent 4,082,513

I declare that, as a person of ordinary skill in the art of catalyst or additive injection system, having read the U.S. Patent 4,082,513, Andon only discloses non-mobile injection system that is just capable of **'receiving catalyst'** from trucks or cars. The injection system is used for batch dispensing of precise quantities of catalyst to an FCC unit. The necessary physical characteristics for any FCC catalyst injection system include the ability to be pressurized to a level above that of the FCC unit and the ability to dispense discrete measured quantities of catalyst to enable process control of the FCC unit during refining. In Andon, the injection system includes non-mobile catalyst storage tank (10) coupled to a non-mobile addition hopper (16). The catalyst storage tank (10) is

periodically filled with catalyst received from the truck or car and the catalyst is then transferred from the non-mobile addition hopper (16) to an FCC unit. Andon discloses wherein the non-mobile hopper is directly coupled to the FCC unit (col. 2 line 26). The valve 28 to the tank (10) may be left open or closed and is not adapted to control the flow of catalyst directly to the FCC unit, The mobile aspect, i.e. the truck or car, is not and cannot function as an injection system to directly control the flow of catalyst to the FCC unit because it does not have the physical characteristics required to function as an injection system. Andon fails to disclose a catalyst injection system that itself is **mobile** and a catalyst injection system configured to be **coupled** to an FCC unit and adapted to **control.**

Furthermore, the September 24, 2007 Office Action (page 4) alleges a person having ordinary skill in the art of catalyst injection systems would easily recognize from a complete reading of Andon that one could bypass the catalyst storage tank (10) of Andon in order to "control the flow of catalyst through the reservoir [i.e. "tank truck" or "tank car"] outlet directly to the fluid catalyst cracking unit," e.g. by delivery of the catalyst from the catalyst reservoir to the carrier line (19) and then directly to the fluid catalyst cracking unit (see Andon, drawing).

The Office Action's conclusion is technically incorrect and impossible because the truck, as disclosed in Andon, is incapable of discharging catalyst from a low pressure environment found in the tank of the truck to a higher pressure system such as an FCCU (fluid catalytic cracking unit) and the injection of catalyst to the FCCU would be inoperable from the truck if the injection system of Andon was bypassed.. Trucks of the type disclosed in Andon are designed for a maximum pressure of about 15 psi in contrast to the FCCU which operates from about 20 up to 40 psi. The pressure rating of such disclosed trucks are known to one of ordinary skill in the art. Non limiting examples of truck psi, as known to one of ordinary skill in the art, are in attached citations of page 1 of Pneumatic Technology Inc. The operation pressures of the FCCU are known to one of ordinary skill in the art. Non limiting examples of FCCU operational pressure, as known

to one of ordinary skill in the art, include:
http://www.refiningonline.com/engelhardkb/crep/TCR1_5.htm
http://www.ogj.com/articles/save_screen.cfm?ARTICLE_ID=128542.

Hence, trucks, as disclosed in Andon, are inoperable to bypass the catalyst storage tank and discharge into a higher pressure system of the FCCU because the pressure differential from the truck to the FCCU is in wrong direction as catalyst cannot flow from low to high pressure. Furthermore, the trucks of the type disclosed in Andon do not have a flow control device for controlling the precise batch delivery of catalyst to an FCCU.

Furthermore, one of ordinary skill in the art would not be motivated to modify by bypassing the catalyst storage tank based on savings in capital, labor, and or square footage, as such modification(s) would actually increase capital cost, labor, and or square footage as shown by the attached reference.

Regarding labor and capital, labor and capital are actually increased because more material is needed as a truck, as disclosed in the references, has too high a capacity for this purpose. For example, a typical FCCU injection system capacity ranges from 1-12 tons, while a truck as disclosed in the references has a capacity of about 25 tons. Furthermore, as discussed above, the trucks as disclosed are inoperable to bypass the catalyst storage tank and discharge into a higher pressure system of the FCCU because catalyst cannot flow from low pressure of the truck to high pressure of the FCCU.

Furthermore, labor or cost is also increased because more than 1 truck is needed; at least 2 trucks are needed, since 1 truck must be available to replace the first truck immediately when it becomes empty. The cost of a truck is about $68,000-$100,000; hence, the cost of 2 trucks is $138,000-$200,000 (without trailer). See www.arrowtruck.com. Additionally, the use of 2 trucks would require even more catalyst to be available at the refinery. Thus, cost is actually increased in attempts to bypass the catalyst storage tank.

Square footage is also increased as compared to conventional injection systems. As discussed above, at least 2 trucks are needed to replace 1 truck as another truck is switched in its place. The square footage of an average truck is 320sq ft compared to average square footage of an addition system which ranges from about 33 to about 224 square ft. For example, average square foot of a truck is length multiplied by width. In this case, the truck has an average width of 8 feet and has a length of about 40 feet which includes length of wheel base and trailer of 18 ft + 22 ft. Hence, an average truck as disclosed in the references has an average square foot 320, which is length of 40 multiplied by width of 8. Furthermore, if 2 trucks are needed, average square footage of 2 truck is about 620 sq ft compared to average square footage of an addition system which ranges from about 33 to about 224 square ft.

Average square foot of injection systems based on the table and link below of length multiplied by width, ranges from about 33 square ft to 224 sq. ft.

http//www.intercatinc.com/additionsystems.htm

| Volume ($ft^3$) | Capacity (tons) | Height (feet) | Width (feet) | Length (feet) | Vessel Diameter (feet) | Approx Weight (lbs.) |
|---|---|---|---|---|---|---|
| 50 | 1 | 18 | 5.5 | 6.0 | 3 | 2500 |
| 200 | 5 | 21 | 7.5 | 7.5 | 5 | 5600 |
| 500 | 12 | 35 | 11.5 | 11.5 | 7 | 12000 |
| 1100 | 27 | 44 | 14.0 | 12.0 | 8 | 26000 |
| 2500 | 62 | 56 | 14.5 | 15.5 | 10 | 37500 |

4. Nonobviousness over Andon in view of US Patent 6,132,157 Comardo

Comardo fails to provide the missing elements or motivation to modify that Andon lacks, as discussed above. Comardo discloses loading of *pellets* into the reaction tubes of the reactor to achieve an even drop rate while the system is *shut down* at *atmospheric pressure as shown below*:

> "catalyst loading system for utilizing catalyst from a bulk supply located adjacent but not on the upper tube sheet of a catalytic reactor and for mechanized measuring of multiple identical quantities of catalyst and for mechanized loading of catalyst pellets into the reaction tubes of the reactor to achieve even drop rate" (Abstract)

Comardo fails to disclose an injection system for FCC unit and does not disclose a reactor of an fluid catalytic unit; the reactor of Comardo is fundamentally different and does not disclose an injection system for an FCC unit nor a mobile injection system for delivering catalyst to an FCC unit, and also fails to disclose adding *catalyst* by a mobile injection system to the regenerator of an FCC system while the FCC system is *in operation at high pressure.*

Thus, Comardo teaches loading of *pellets* into the reaction tubes of the reactor to achieve even drop rate while the system is *shut down* at *atmospheric pressure* as opposed to adding *catalyst* to the regenerator of an FCC system by a mobile injection system while the FCC system is *in operation at high pressure.*

Comardo, when viewed in combination with Andon, is inoperable and is not properly modifiable or combinable in view of Andon without destroying Comardo's intended purpose for loading *pellets* into the reaction tubes of the reactor to achieve even drop rate while the system is *shut down at atmospheric pressure* as opposed to adding catalyst to the regenerator of an FCCU while the FCC system is *in operation at high pressure.*

5. Nonobviousness over U.S. Patent 4,769,127 Erickson

Erickson Erickson (U.S. 4,769,127) fails to disclose a catalyst injection system that itself is **mobile**, a catalyst injection system **configured** to be coupled to an **FCC unit** and a catalyst injection system adapted to control the flow of catalyst **directly** to the **FCC unit**. By words and drawings, Erickson only disclose a catalyst storage container

(400) that is temporarily and transiently made mobile by being **carried and transported by a trolley**/monorail to a **fresh catalyst silos 68 or 70** and the catalyst must then be transferred to the addition hopper (86 or 88) which is not mobile and not made mobile; it is the non-mobile addition hopper (86 or 88) which then actually delivers the catalyst to the FCC unit while the **container (400) is not designed to deliver catalyst to a pressure system such as FCC unit.**

Erickson's Figure 3 also shows that Erickson's catalyst storage container is just temporarily made mobile by being **carried and transported by a trolley**/monorail to a **fresh catalyst silos 68 or 70** and is incapable of being **configured** to be coupled to an **FCC unit** and is adapted to **control flow of catalyst directly** to the **FCC unit** because the catalyst must then be transferred to the addition hopper (86 or 88); it is the non-mobile addition hopper which is the injection system that adds the catalyst to the to reactor. The container (400) cannot be considered an injection system because it lacks the physical characteristics identified above required to function as an injection system.

6. Nonobviousness over Erickson in view of Comardo

Erickson and Comardo respectively fail to provide the missing element or motivation as discussed above and are not properly combinable or modifiable, when viewed together, because their intended purpose are destroyed and teaches away.

Erickson is inoperable and is not properly modifiable or combinable in view of Comardo to disclose an injection system that is mobile and adapted to control flow of catalyst directly to the FCC unit, without destroying Erickson's intended purpose of a catalyst storage container just temporarily made mobile by being carried and transported by a trolley/monorail to a fresh catalyst silos 68 or 70 and incapable of being configured to be coupled to an FCC unit and incapable of being adapted to control flow of catalyst directly to the FCC unit.

Furthermore, Comardo cannot be modified in view of Erickson without destroying Comardo's intended purpose of loading of *pellets into the reaction tubes* of

the reactor to achieve even drop rate while the system is *shut down at atmospheric pressure*, as opposed to adding catalyst to the regenerator of an FCC system while the FCC system is in operation at high pressure.

7. Nonobviousness over Erickson in view of Haugen US Patent 2,616,591

Haugen fails to provide the missing elements or motivation to modify that Erickson lacks, as discussed above.

Haugen discloses top open measuring devices traveling in a circuit over a table to an open spout; Haugen fails to disclose a vessel configured to deliver catalyst to a fluid catalytic cracking unit as an open spout does not and cannot deliver catalyst to a pressurized FCCU. The open spout would just result in a spillage of the catalyst instead of delivery to the FCCU. Furthermore, Haugen's teaching of an open top and open spout measuring device fails to disclose a pressurizable plenum as the open top does not and cannot allow a pressurizable plenum, in contrast to an FCCU which has a pressure from about 20 up to 40 psi. Hence, Haugen is inoperable to discharge from atmospheric or low pressure into a higher pressure system such as an FCCU of 20 up to 40 psi because a system cannot deliver from atmospheric or low pressure to higher pressure system. Similarly, the truck, such as disclosed in the references, cannot by pass the catalyst storage tank because catalyst cannot flow from atmospheric or low pressure to a higher pressure system.

Furthermore, Haugen is inoperable and is not properly modifiable or combinable in view of Erickson to disclose a pressurizable injection system that is mobile and adapted to control flow of catalyst directly to the FCC unit, without destroying Haugen's intended purpose of an open top open spout non pressurizable system.

8. Andon in view of Haugen

Andon and Haugen respectively fail to provide the missing element of motivation as discussed above and are not properly combinable or modifiable, when viewed together, because the intended purpose is destroyed and teaches away. Andon, as discussed above, fails to disclose a catalyst injection system that itself is mobile and is configured to be coupled to an FCC unit and adapted to control the flow directly to the FCC unit because Andon's catalyst storage tank is neither mobile nor configured to be coupled to an FCC unit and nor can the truck of Andon be an injection system because it is not adapted to control the flow of catalyst directly to the FCC unit.

Haugen fails to provide the missing elements of motivation to modify. As discussed above, Haugen fails to disclose a vessel configured to deliver catalyst to a fluid catalytic cracking unit as an open spout does not and cannot deliver catalyst to an FCCU. The open spout would just result in a spillage of the catalyst instead of delivery to the FCC unit. Furthermore, Haugen's teaching of top open and open spout measuring devices also fails to disclose a pressurizable plenum as the open top does not and cannot allow a pressurizable plenum, as recited claims 19-21, 23-24, and 33. Such self limiting structural and functional restrictions of Haugen are not just differences in degrees, but differences in kind which teach away from and or is inoperable to deliver catalyst to a fluid catalytic cracking unit and provide pressurizable plenum.

9. One of ordinary skill in the art would not be motivated to modify, in view of a combination of the cited references, by bypassing the catalyst storage tank based on savings in capital, labor, and or square footage, such modification(s) would actually increase capital cost, labor, and or square footage for the reasons discussed above in section 4.

10. The undersigned, Martin Evans, hereby declares that all statements made herein of my own knowledge are true and that these statements made on information and belief are believed to be true and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent resulting therefrom.

24 January 2008

Date

Martin Evans